FEEDBACK DEVICE HAVING ELECTRICALLY CONDUCTIVE FABRIC

FIELD OF THE INVENTION

[0001] The present invention relates to devices for monitoring the motion of structures and/or forces on and within moving structures. The invention has particular application to a device for immediate biofeedback in response to the motion and/or forces generated by the moving structures.

BACKGROUND OF THE INVENTION

[0002] Within the discipline of biomechanics , the primary interest of researchers is focused on examining the forces acting upon and within biological structures as well as the effects produced by these forces. In this field many principles are drawn from related disciplines such as anatomy, psychology, mathematics, physics and mechanics. These principles are used to gain a better understanding of the biological effects of forces on living tissues, growth and development, overload and injury, and other factors affecting the movement of body segments. Biomechanics therefore has application in a diverse range of occupations including orthopaedic surgery, exercise rehabilitation, ergonomics, biomedical engineering as well as coaching and teaching sports skills.

[0003] The invention is disclosed herein with particular reference to its application as a sports training tool and rehabilitation aid. However, it will be immediately apparent to those of ordinary skill in this field that the present invention is readily applicable to many other uses and applications. For example, it may be easily adapted for use as means for generating input signals for controlling a device such as a computer. It could also be adapted for many different types of amusement novelties or playthings.

[0004] Within the arena of sport, biomechanics has numerous applications including:

[0005] identifying techniques to optimise sports performance while minimising the risk of injury to the performer;

[0006] evaluating the effects of rule modifications on player safety and performance; and

[0007] developing appropriate sports equipment both to enhance performance and to protect athletes. This equipment includes items required to participate in a sport, such as sporting implements as well as clothing which is suitable for the athlete to perform the required skills.

[0008] To better understand the motion of segments and the forces acting on the human body during movement, biomechanists employ a variety of quantitative techniques. These include electromyographic devices to measure muscle activity, cine/video or optoelectronic devices to quantify the external motion of an athletes body segments and force platforms or other dynamometry devices to measure the forces generated during a performance. Information from these devices is combined with data describing the dimensions of an athlete's body segments to mathematically model the forces generated during a performance and the effects of these forces on the athlete's body.

[0009] Although advances in technology have provided highly sophisticated apparatus for biomechanical analysis of human performance, some restrictions and disadvantages exist. For example, many of the devices that are attached to an athlete's body during a performance analysis have rigid components, which do not conform to the athlete's body shape. This will tend to interfere with their natural motion during a performance. Other devices have an overly restricted operational range. For example, traditional strain gauges are typically restricted to operating over a dynamic range of approximately 10% (that is a 10% variation in the length of the operational sections of the strain gauge).

SUMMARY OF THE INVENTION

[0010] It is an object of the present invention to overcome or ameliorate at least one of the disadvantages of the prior art, or to provide a useful alternative.

[0011] According to a first aspect, the present invention provides a feedback device for a structure, the device including:

[0012] electrically conductive fabric for establishing an electrical current path with an electrical impedance, such that mechanical input to the device causes a change to the electrical impedance;

[0013] a voltage source to cause current to flow along the current path; and

[0014] a sensor for detecting change in the electrical impedance of the current path and producing an immediate feedback indication in response to a predetermined mechanical input to the device.

[0015] According to a second aspect, the present invention provides a method for producing a feedback indication in response to a mechanical input to a device, the method including:

[0016] attaching electrically conductive fabric to the structure, the fabric having an electrical current path position on the structure such that a predetermined mechanical input to the structure causes the electrical impedance associated with the current path to change;

[0017] applying a voltage across the current path; and

[0018] using a sensor for detecting the change in the impedance and producing an immediate feedback indication.

[0019] Preferably, the device is a biomechanical feedback device and the structure is a moveable biological structure. In another preferred form, the electrically conductive fabric is an elastic fabric at least partially coated with an electrically conductive polymer material.

[0020] Preferably, the elastic fabric is formed for close fitting to the biological structure and movement therewith. In a particularly preferred form, the fabric is a synthetic fabric such as that marketed under the trade mark "lycra™. Please note that "lycra™" is the registered trade mark of E I Du Pont De Nemours and Company. However, the elastic fabric may also include other suitably elastic fabrics such as wool or polyester. Alternatively, the electrically conductive